SECTION 9

PART C

TRANSFER GEARBOX AND DRIVE SHAFT

Transfer Gearbox and Drive Shaft- 4 Wheel Drive

Part C

Operation No.	Description	Page No.
9C.1	Specification ...	9C - 3
9C.2	General description - Transfer gear box ...	9C - 3
9C.3	Drive shaft - removal ...	9C - 5
9C.4	Drive shaft - overhaul ...	9C - 6
9C.5	Transfer gears - overhaul ...	9C - 9
9C.6	Transfer gearbox - removal ...	9C - 11
9C.7	Transfer gearbox - overhaul ...	9C - 13
9C.8	Drive shaft seal replacement - all models ...	9C - 16

9C.1 SPECIFICATION:

Model application	...	MF2605/2615 4 WD

Bolt Torques

Pinion bearing assembly	...	80 lbf.ft. (108 Nm)
Transfer box to casing	...	63 lbf.ft. (86 Nm)
Drive shaft flange bolts	...	48 lbf.ft. (65 Nm)
Drive coupling bolt	...	92 lbf.ft. (125 Nm)
Idler shaft end float	...	0.004 - 0.008 inch (0.10 - 0.20 mm).

Special Tools

MF.490	...	Four-wheel drive cassette seal installer.
SER / 060	...	Pinion lock nut 'C' spanner.
SER / 061	...	Pre load checking gauge aid

9C.2- General Description Transfer Gears

The drive for the front axle is taken from t h e pinion shaft by a gear splined to a hub located between the pinion bearings and the retaining nut. There are two sets of idler gears, the first set being a compound set running on needle roller bearings on a hardened sleeve around the PTO shaft. The second, is a single gear which is mounted with in the transfer box and drives the output gear to the drive shaft.

The output gear with in the transfer box is free to rotate on the front of the output shaft. The rear face of the gear is fitted with a simple tooth type coupling. Engaging with the gear and splined to the output shaft is a sliding coupler with a light spring between the gear and coupler to assist in disengagement. Behind the sliding coupler is an abutment ring, held in place on the shaft by a circlip.

Between the abutment ring and the coupler there are three radial toggle pins which pass through to the centre of the shaft and engage in a groove in the actuator shaft.The actuator shaft is controlled through linkage by the operator.

When the control rod is pulled up and the actuator shaft moved forward, as shown in the lower half of fig 1 illustration. The three toggle pins are forced up in to the vertical position moving the sliding coupler forward against the abutment ring into the engaged position.Moving the actuator shaft to the rear, as shown in the upper half of fig 1 illustration. This moves the toggle pins down into the shaft and allows the sliding coupler to disengage under pressure from the return spring. The teeth on the gear and the coupler are shaped to allow engagement and disengagement under load.

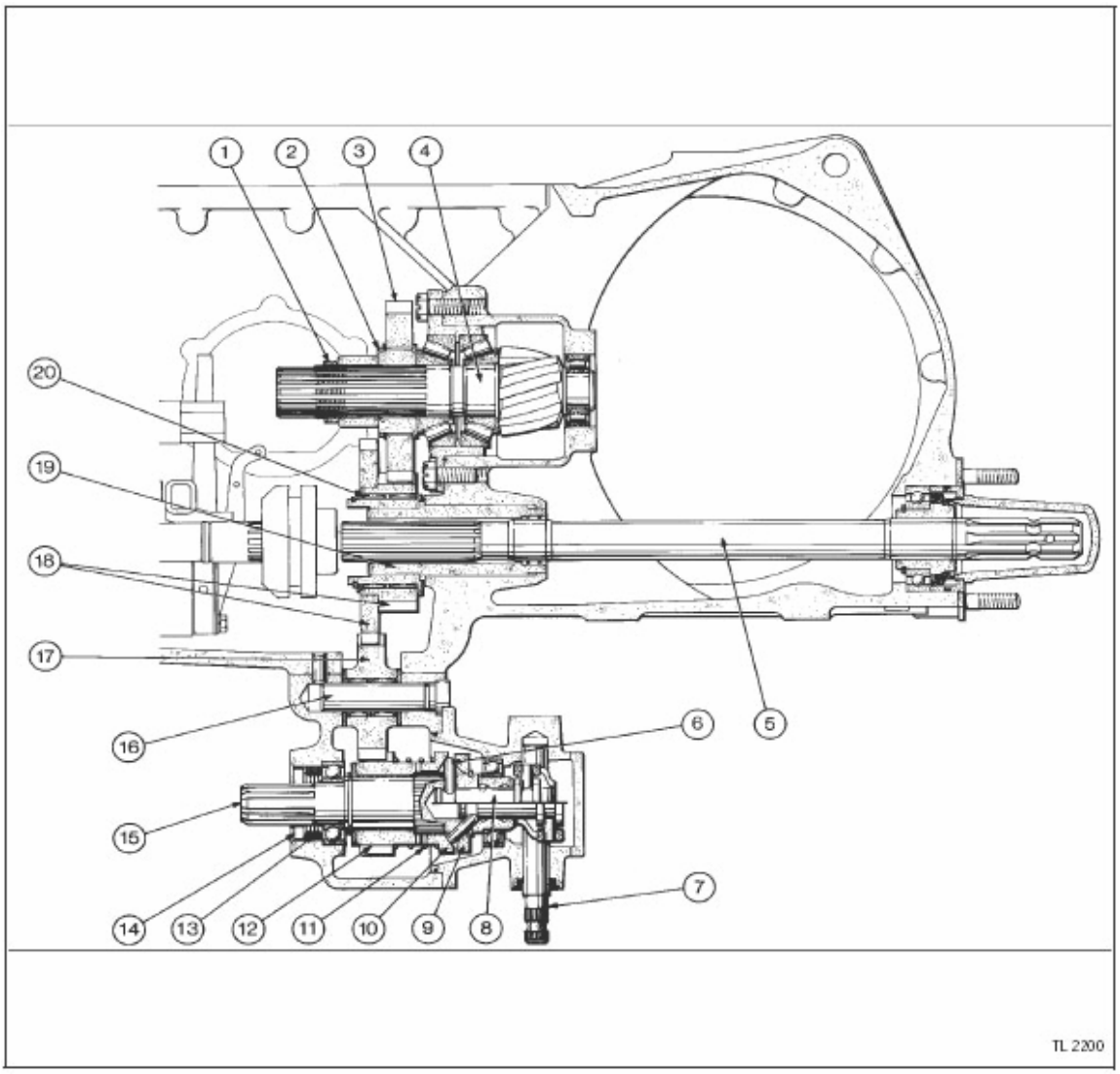

Fig 1

1. Retaining nut.
2. Drive gear hub.
3. Drive gear.
4. Pinion shaft.
5. PTO shaft.
6. Toggle pin.
7. Actuator shaft.
8. Actuator piston.
9. Abutment ring
10. Clutch coupler.
11. Retaining spring.
12. Drive gear.
13. Oil seal.
14. Dirt seal.
15. Drive shaft.
16. Intermediate shaft.
17. Intermediate gear.
18. Idler gears.
19. Support sleeve.
20. Needle roller bearing.

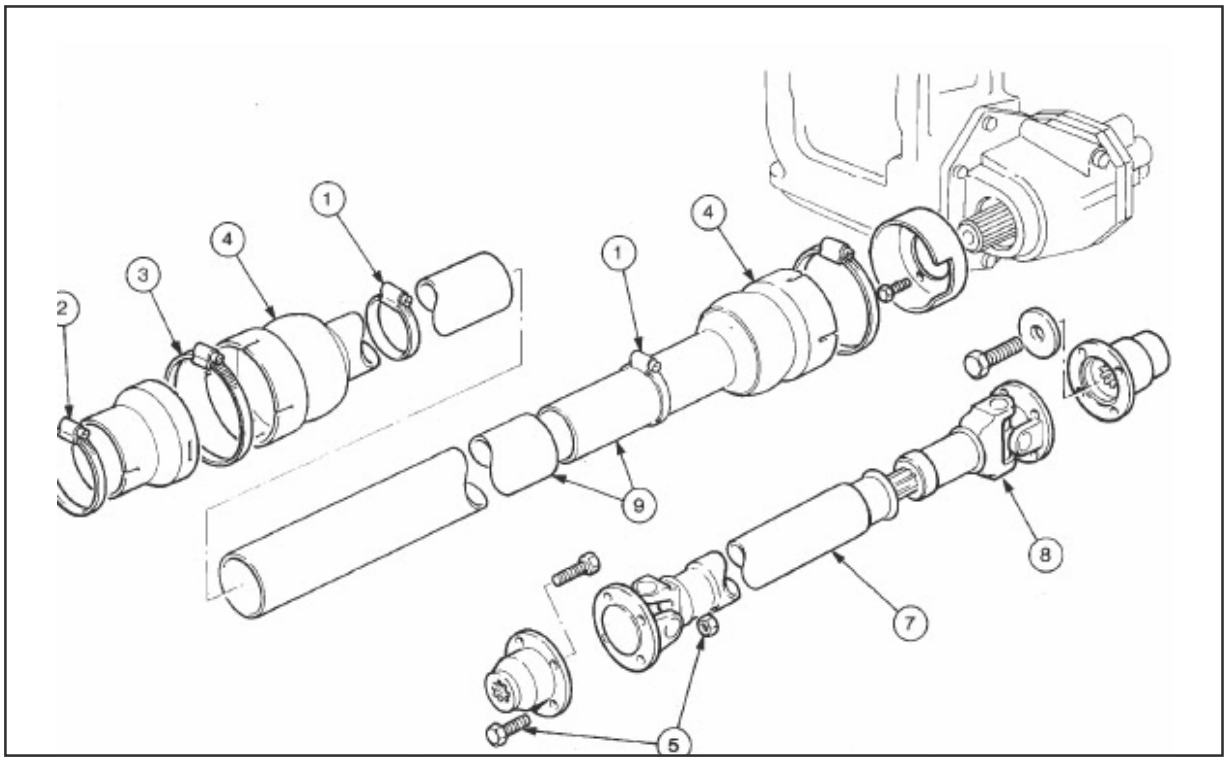

Fig 2

9C.3 - DRIVE SHAFT

Removal and refitment

Removal

1. Slacken the two clips on the guard.
2. Slacken the clip on the guard at the transfer box end.
3. Remove the clip from the guard at the axle end.
4. Slide the guard at both ends towards the centre to expose both couplings.
5. Remove the four bolts from each coupling and lift the drive shaft clear of the tractor.
6. Slide the rear part of the coupling back to expose the sliding joint in the shaft.
7. Unscrew the retaining ring.
8. Slide the rear part of the coupling off the shaft.
9. The guards can now be removed from the shaft.

Refitment:

10. Lubricate both universal joints and sliding joint with grease. To lubricate the sliding joint it will be necessary to remove the small plug and replace it with a 1/4 in. UNF thread (Massey Ferguson part No. 13 811 X1).
11. When reassembling the drive shaft ensure that the two arrows stamped on the shaft are in line.
12. Apply Massey Ferguson Stud Lock (Loctite 270) to the threads of both sets of coupling bolts and tighten the nuts to a torque of 48 lbf.ft. (65 Nm).
13. The drain hole in the guard at the axle end must be at the bottom.
14. Position the guards as shown in the illustration. Ensure that the drive shaft couplings are not rubbing on the inside of the guard.

9C.4 - DRIVE SHAFT

Overhaul

Dis-assembly

1. Remove the drive shaft, see operation 9C.3.
2. Using a soft drift, tap the outside of the bearing assembly to loosen the snap ring. Tap the bearing only hard enough to break the assembly away from the snap ring.

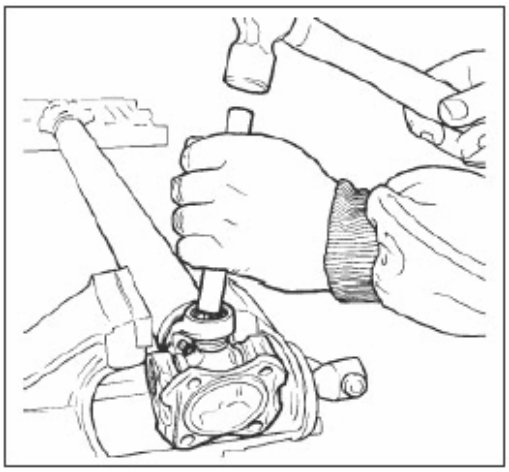

Fig 3

3. Remove the snap ring from the yoke. Turn the joint over and remove the opposite snap ring.
4. Set the yoke under a hand press with a piece of tube stock beneath it. Position the yoke with the grease nipple pointing up to prevent interference during dis- assembly.

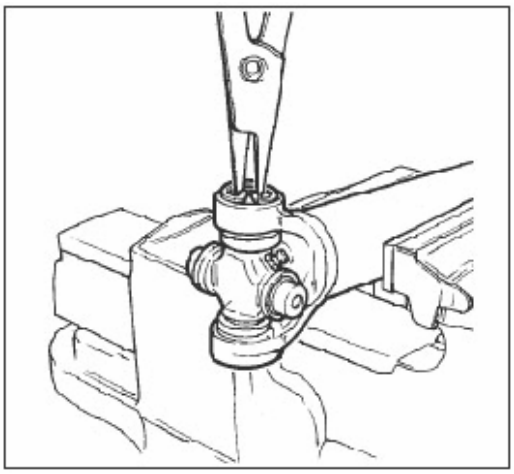

Fig 4

5. Place a solid plug on the upper bearing assembly and press it through to release the lower bearing.
6. If the bearing assembly will not pull out by hand after pressing, tap the base of the lug near the bearing assembly to dislodge it.

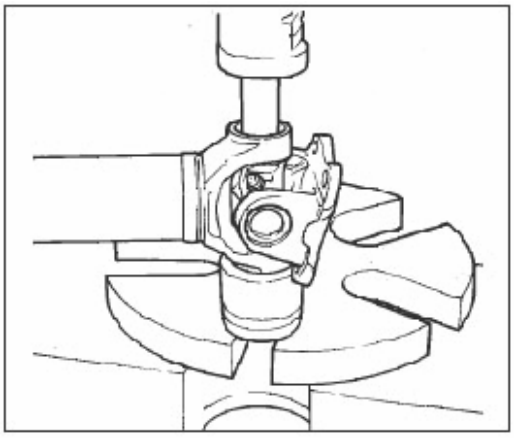

Fig 5

7. To remove the opposite bearing assembly, turn the yoke over and straighten the cross in the open hole. Then carefully press on the end of the cross so the remaining bearing assembly moves straight out of the bearing cross hole.
8. If the cross or bearing assembly are not in line, the bearing assembly will score the walls of the cross hole and ruin the yoke.
9. Repeat this procedure on the remaining bearing assemblies to remove the cross from the yoke.

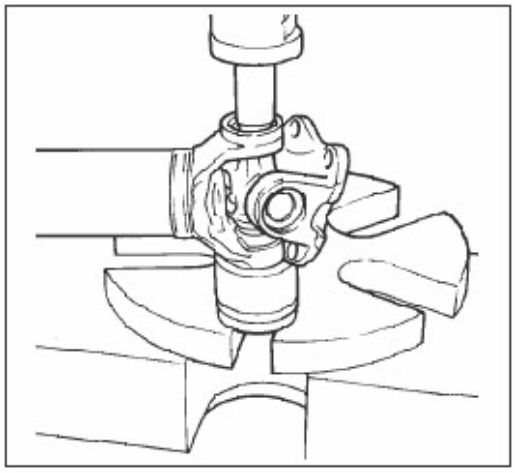

Fig 6

Re-assembly

10. Pack the four cavities of the cross with a high quality, extreme pressure N.L.G.I Grade 1 or 2 grease.
11. Pack each bearing assembly almost full with grease.
12. Position the cross in the yoke with its grease nipple on the inboard side (toward the driveshaft).

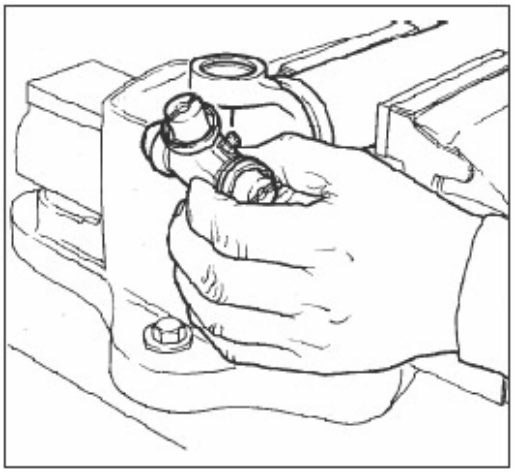

Fig 7

13. Move one end of the cross so that it projects through the bottom cross hole in the yoke.
14. Place a bearing assembly over the trunnion end of the cross and align it with the cross hole in the yoke.
15. Using a hand press, hold the trunnion in alignment with the cross hole and place a solid plug on the bearing assembly.

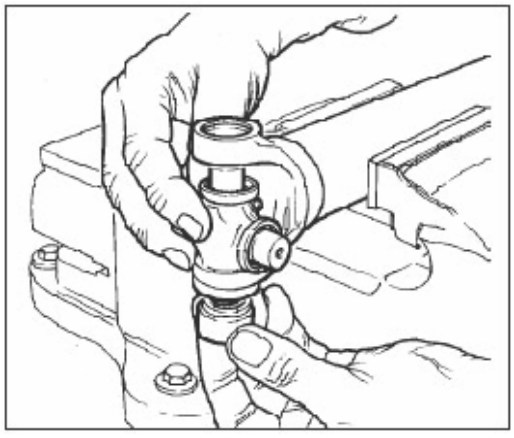

Fig 8

17. Fit a snap ring.
18. Repeat procedures 14 to 17 to assemble the opposite bearing.
19. If the joint is stiff, strike the yoke ears with a hammer to seat the needle roller bearings.

CAUTION: Be sure that the snap rings are properly seated in the grooves.

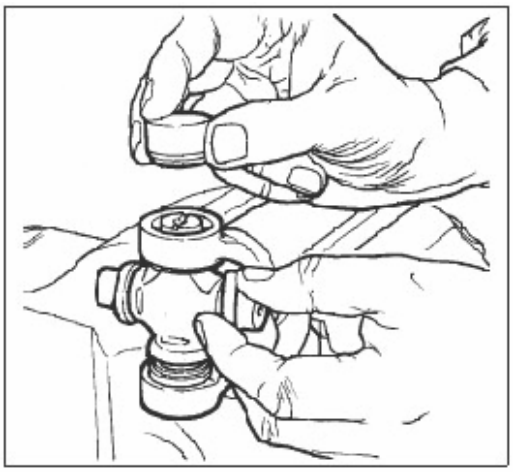

Fig 9

20. Repeat procedures 10 to 19 at the opposite end of the driveshaft if fitting a second kit.
21. Make sure you keep the grease nipples at each end of the driveshaft in line.

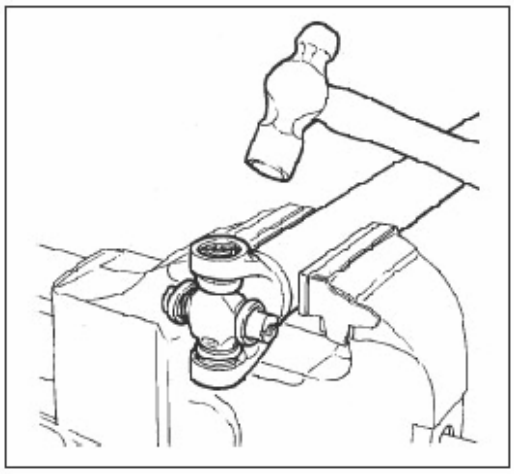

Fig 10

22. Ensure that both yokes at each end of the drive shaft are in phase. There are alignment arrows stamped on the slip yoke and on the tube shaft to assure proper phasing when assembled.
23. Fit the re-assembled driveshaft to the tractor.
24. Apply more grease through the grease nipples until grease appears at all four bearing seals.

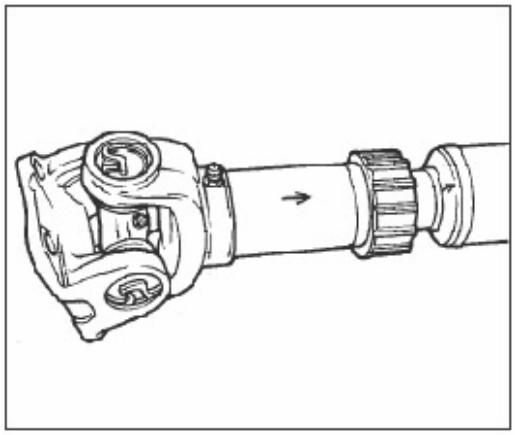

Fig 11

9C.5 - TRANSFER GEARS

Overhaul

Dis-assembly

1. Split the tractor between the gearbox and the centre housing and remove the hydraulic lift pump.
2. Remove the transfer gearbox, see operation 9C.6
3. Remove the PTO shaft, see operation 12A - 4.
4. Remove the snap ring and slide the pinion off the hub.
5. Remove the six bolts and spring washers.
6. Screw one of the bolts into each of the two tapped holes.
7. Tighten the bolts, thus withdrawing the pinion assembly.

NOTE : *Refer to Fig 14.*

8. Release the tab washer (Item 10 in Fig 14) from the lock nut by using a cold chisel or screw driver.
9. Using a lock 'C' spanner SER / 060 and preload checking gauge SER / 061 aid and remove the lock nut.
10. Remove the tab washer.

    NOTE: *Care should be taken to avoid damaging the threads of the pinion if it is to be reused.*

11. Refer paragraph number 9 to remove the second lock nut.
12. Remove the splined hub.
13. If necessary, remove the housing complete with bearings.
14. Remove the external circlip.
15. Remove the thrust washer.
16. Remove the intermediate gear, roller bearings and spacer.
17. Drive the needle roller bearing out of the end of the bearing support tube.
18. The inner bearing sleeve "A' is fixed to the bearing support tube "B' by Massey Ferguson Retainer Compound (Loctite 601). If there is a need to replace the sleeve due to bearing failure it can be removed by heating the sleeve up to a temperature of approximately 302°F(150°C) this will release the Retainer Compound so that the sleeve can be pulled off the support tube.

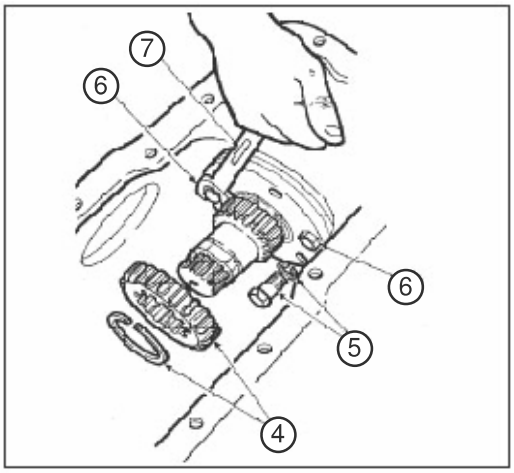

Fig 12

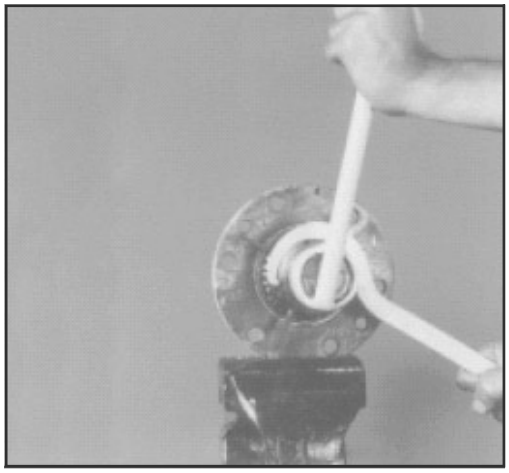

Fig 13

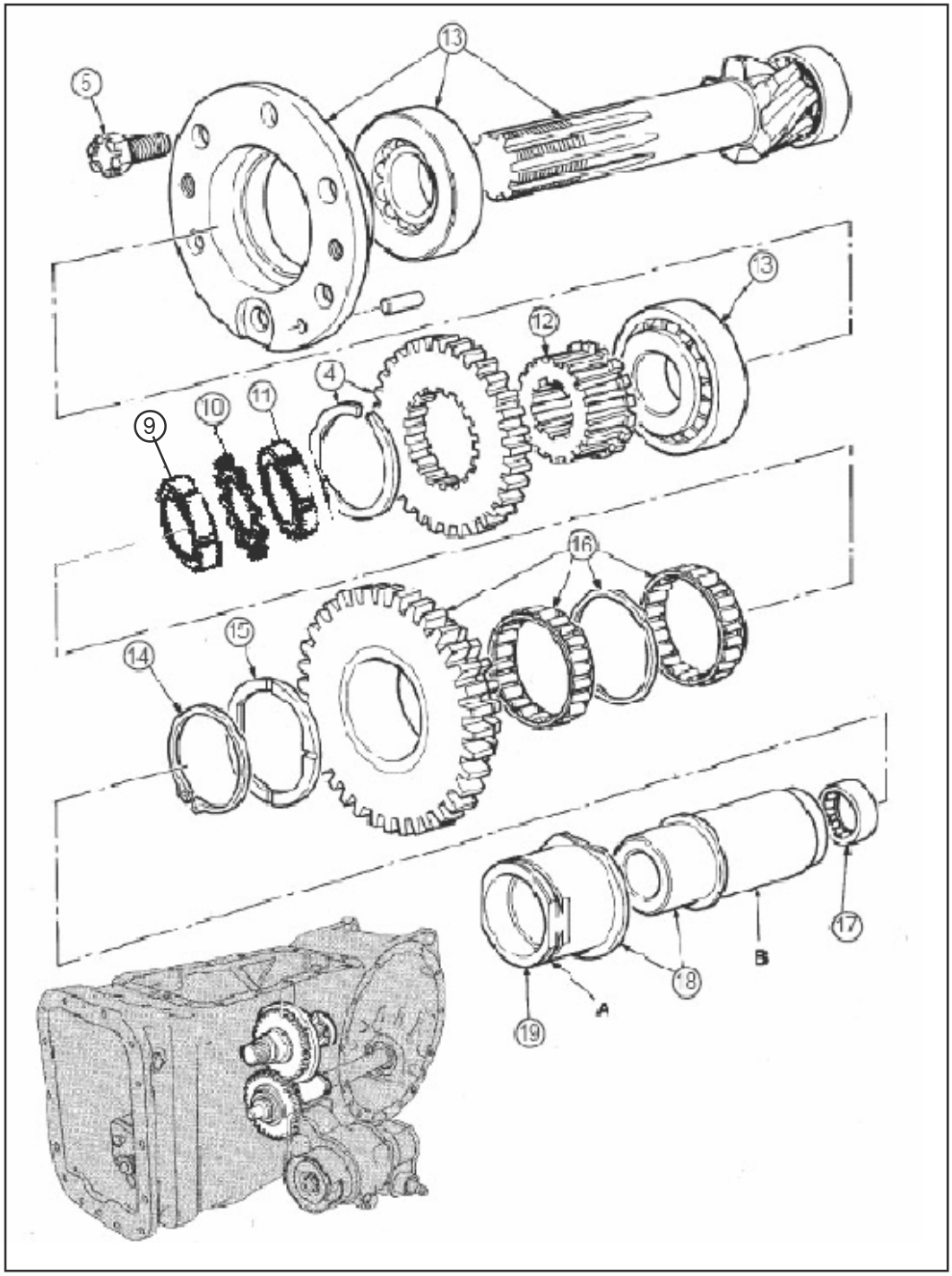

Fig 14

The bearing support tube "B' is also retained in the centre housing by the use of Massey Ferguson Retainer Compound (Loctite 601). Since there are no moving parts associated with this item it is unlikely that it will require removal.

Examination : Clean and carefully examine all the components, especially those subject to movement, and renew any items that show signs of damage or wear. Renew all circlips, snap rings and 'O' rings, when re-assembling ensure that they are correctly located in their grooves.

Re-assembly

The re-assembly of the unit is a reverse procedure of its dis-assembly. The following instructions are a further guide with details on any particular instructions that may apply.

19. If the inner bearing sleeve has been removed, clean the external surface of the bearing support tube with fine emery cloth. Degrease both components and dry. Apply Massey Ferguson RetainerCompound (Loctite 601) to both the surfaces and slide the inner bearing sleeve into position with the machined flat uppermost as shown in the illustration. Wipe off any excess compound. Allow 15 minutes for the Retainer Compound to cure before proceeding further with the assembly.

20. If the pinion bearing assembly has been taken apart to renew the splined sleeve or bearings, it will be necessary to reset the bearing pre-load.

21. When refitting the transfer box to the centre housing apply Massey Ferguson Instant Gasket (Loctite 515) to the mounting face of the box. Apply Massey Ferguson Stud Lock (Loctite 270) to the drive shaft flange bolts.

22. The following bolt torques will apply:

Pinion bearing assembly	80 lbf.ft.(108 Nm)
Transfer box to casing	63 lbf.ft.(86 Nm)
Drive shaft flange bolts	48 lbf.ft.(65 Nm)

9C . 6 TRANSFER GEARBOX

Removal and refitment

Removal

1. Drain the transmission oil into a clean container.
2. Loosen the clip on the small diameter part of the drive shaft guard. Remove the clip at the transfer box end and slide back the drive shaft cover.
3. Remove the drive shaft coupling nuts and bolts.
4. Disconnect the control rod at the lower end by removing the split pin and washer.
5. Remove the four bolts.
6. Remove the transfer box. It will be held to the centre housing by the two dowels, use a lever to carefully pry it away from the casing.

Refitment

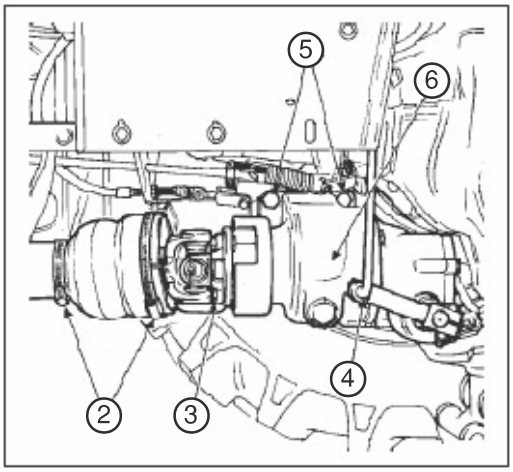

Fig 15

7. Clean the mating faces of the centre housing and the transfer box.
8. Reverse procedure 1 to 6 except:

   a. Coat the mounting face of the transfer box with Massey Ferguson Instant Gasket (Loctite 515)

   b.Tighten the mounting bolts to a torque of 63 lbf.ft (86 Nm).

   c. Tighten the drive shaft coupling nuts and bolts to a torque of 48 lbf.ft. (65 Nm).

   d.Fit a new split pin when connecting the control rod.

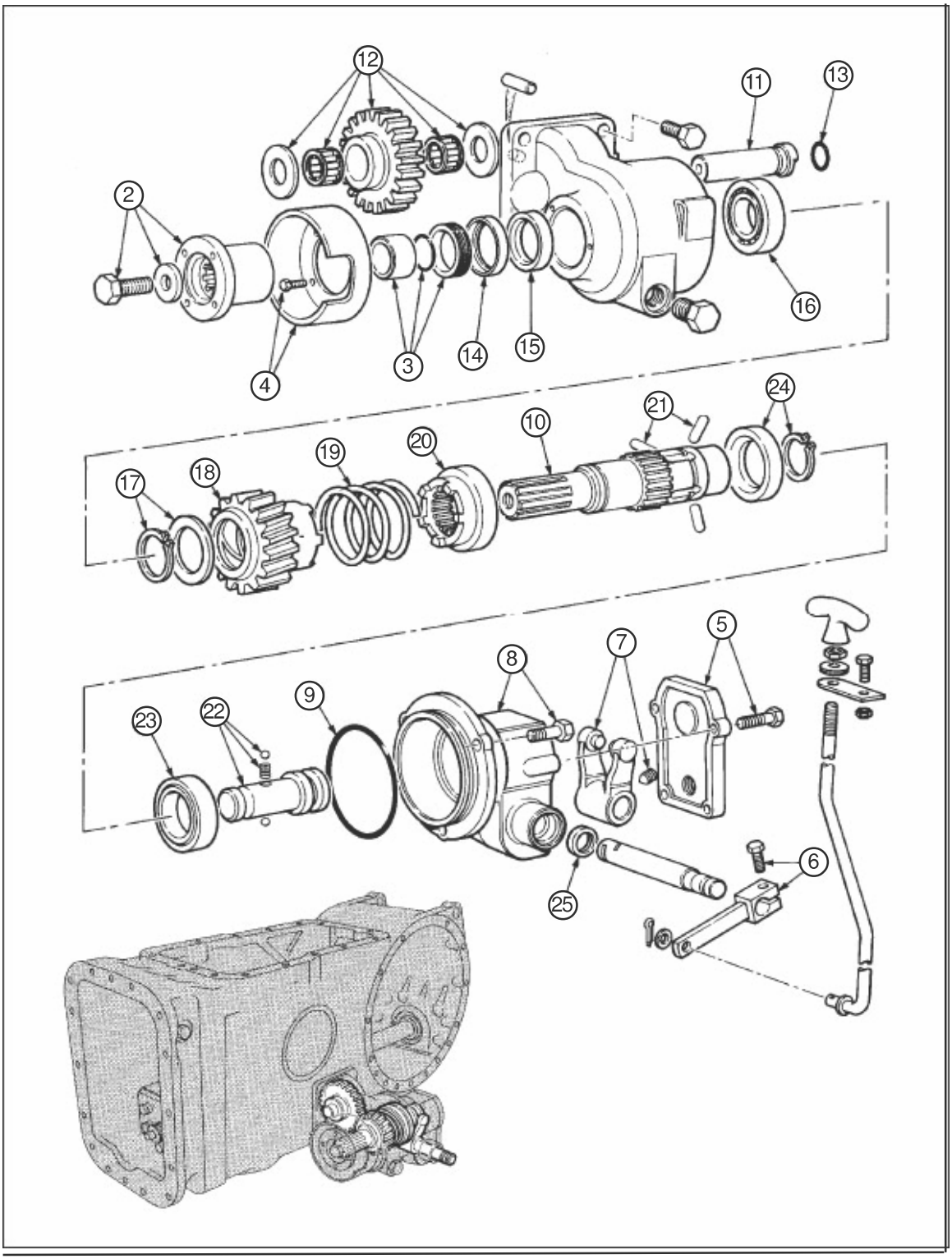

Fig 16

9C . 7 TRANSFER BOX

Overhaul

Dis-assembly

1. Remove the transfer gearbox,
2. Remove the central coupling bolt, and washer, and then remove the coupling from the shaft.
3. Remove the sleeve, 'O' ring and seal.
4. Remove the three setscrews and the guard.
5. Remove the four back cover bolts and the cover.
6. Remove the securing bolt and operating lever.
7. Remove the locking screw and selector fork.
8. Remove the three bolts and the rear housing.
9. Remove and discard the 'O' ring.
10. Remove the shaft assembly complete with gear, bearings and selector mechanism by tapping the coupling end with a soft-blow hammer.
11. Screw a 0.472 inch (12 mm) bolt into the end of the idler shaft and pull it out of the housing.
12. Lift out the gear, two needle roller bearings and thrust washers.
13. Remove the 'O' ring from the shaft and discard.
14. Remove the seal sleeve from the housing.
15. Remove the oil seal from the housing.
16. Using a hydraulic press and bearing separator plate remove the front bearing from the shaft.
17. Remove the circlip and thrust washer.
18. Remove the output gear.
19. Remove the spring.
20. Slide the coupler off the shaft.
21. Remove the three toggle pins.
22. If necessary, very carefully pull the actuator shaft out of the main shaft. There are two spring loaded balls inside.
23. If necessary, remove the rear bearing from the shaft using a hydraulic press.
24. Remove the circlip and abutment ring.
25. Remove the operating shaft oil seal.

Examination

Clean and carefully examine all the components, especially those subject to movement, and renew any items that show signs of damage or wear.Renew all circlips, snap rings and 'O' rings. When re-assembling ensure that they are correctly located in their grooves.

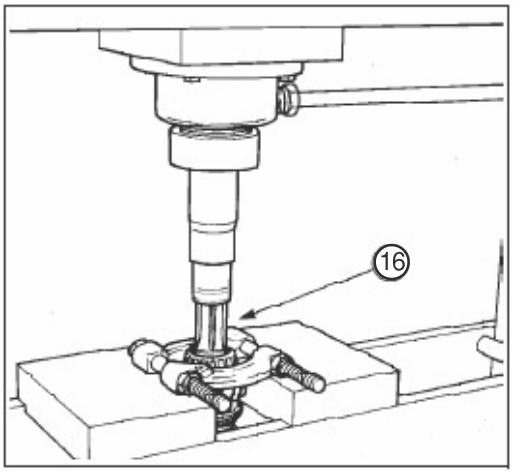

Fig 17

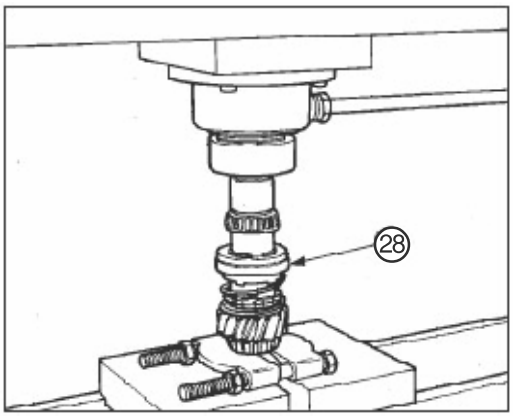

Fig 18

Re-assembly

26. Renew the operating shaft oil seal and lightly lubricate the lips of the seal.
27. Refit the abutment ring with the curved face facing forward to the main shaft with the circlip.
28. Refit the rear ball bearing.

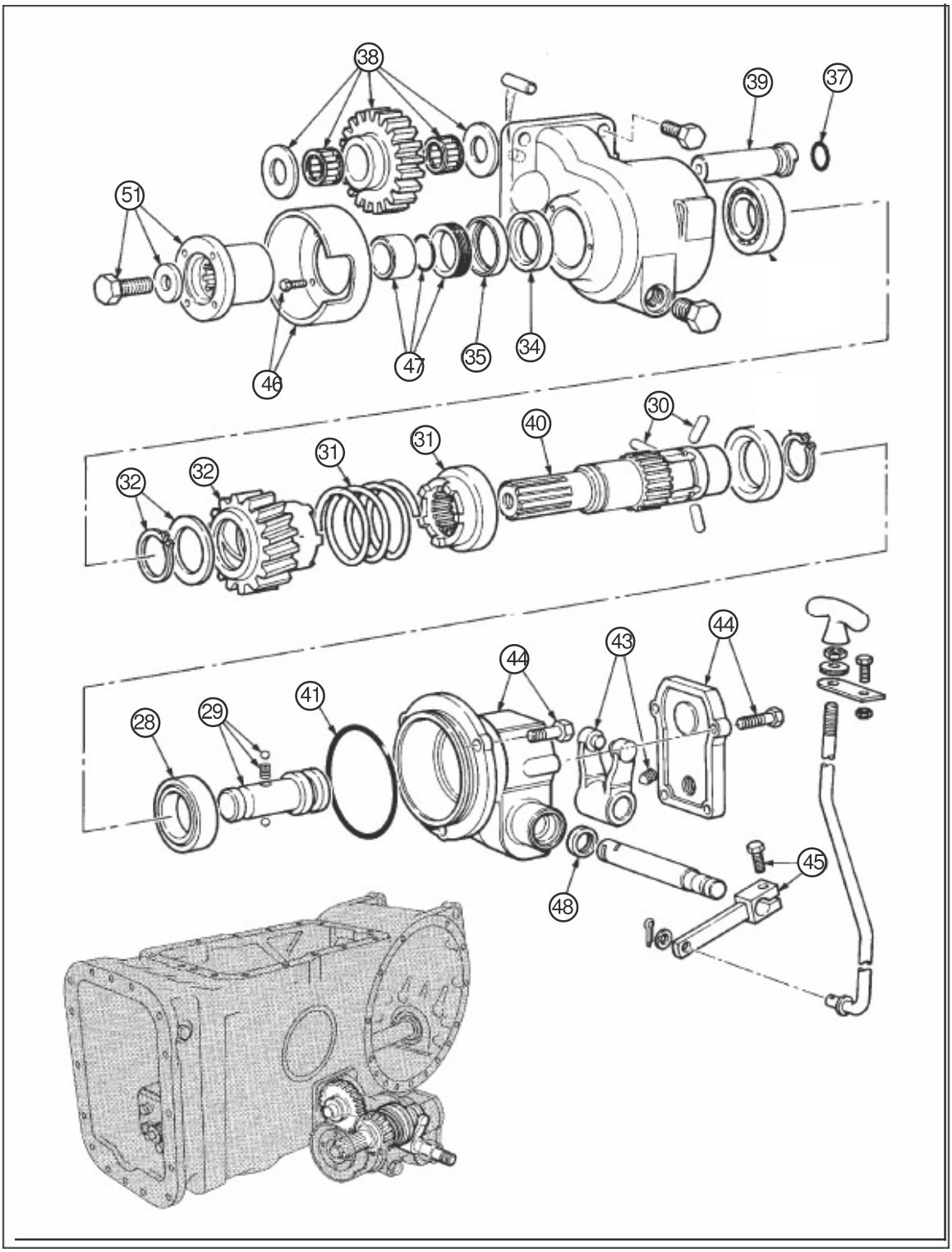

Fig 19

29. Insert the two balls and spring in the cross drilling in the actuator shaft and fit it to the main shaft. Set the actuator in the first, disengaged, position.
30. Fit the three toggle pins through the slots in the main shaft so that they locate in the groove in the actuator shaft.
31. Refit the coupler and spring.
32. Slide the gear onto the shaft followed by the thrust washer and a new circlip.
33. Press the front ball race onto the shaft.
34. Coat the outside of the main shaft oil seal with Hylomar sealant and press it into the housing from the inside of the case so that the seal is 0.010 - 0.020 inch (0,25- 0,50 mm) below the face. The lip of the seal faces inwards.
35. Press the wear sleeve in from the front of the box until it is flush with the case. The rolled edge faces inwards.
36. Lubricate the lip of the seal with petroleum jelly.
37. Renew the 'O' ring on the idler shaft.
38. Fit the idler shaft thrust washer and then pass the roller shaft through the casing. Fit the two needle roller bearings into the gear and fit it to the shaft. Slide in the last thrust washer and press the shaft home.
39. Rotate the shaft so that the flat portion is opposite the aperture in the casing.
40. Fit the main shaft assembly.
41. Renew the 'O' ring and fit the rear housing to the case. Check that the housing fits over the end of the idler shaft correctly.
42. Check that the main shaft rotates without any binding.
43. Fit the operating shaft and fork. Apply Massey Ferguson Stud Lock (Loctite 242) to the thread of the locking screw and tighten.
44. Apply Massey Ferguson Instant Gasket (Loctite 515) to the face of the cover plate and fit it to the gearbox.
45. Refit the operating shaft and tighten the bolt. Check the operation for engagement and disengagement.
46. Refit the drive shaft guard.
47. Renew the 'O' ring on the main shaft.
48. Press a new dirt seal onto the seal spacer ensuring that it is fitted to the end without the recess for the shaft 'O' ring.
49. First coat the splines of the shaft with Hylomar sealing compound, and the dirt seal with a liberal amount of general purpose grease.
50. Refit the spacer and seal assembly.
51. Refit the drive coupling applying Massey Ferguson Stud Lock (Loctite 270) to the threads of the central bolt and tightening to a torque of 92 lbf.ft. (125 Nm).
52. Carry out a final check ensuring that the gears and shafts run freely.
53. Refit the transfer box to the tractor, see operation 9C.6.

9C.8 DRIVE SHAFT SEAL REPLACEMENT

Removal and refitment

Special Tools:

MF.490 -- 4WD Cassette seal installer

Removal

1. Drain the oil from the transmission.
2. Slacken the two clips on the guard.
3. Slacken the clip around the guard at the transfer gearbox end.
4. Slide the guard to the left to gain access to the coupling.
5. Remove the four bolts from the coupling and lower the shaft to the ground.
6. Remove the drive shaft and seal as described in operation 9C - 7 paragraphs 17 to 25 and 35 to 38 inclusive.
7. Replace the drive shaft as described in paragraphs 49 to 52 inclusive.
8. Renew the 'O' ring.

Installing the new seal

9. Liberally coat the inside of the seal with petroleum jelly.
10. Press the sleeve into the seal so that the front (flat) face of the seal is flush with the end of the sleeve.
11. Slide the seal over the output shaft as shown until the seal is just entering the housing.
12. Special tool MF.490 has been designed to install the seal to the correct depth in relation to the housing and sleeve. It also presses the seal in the correct location.
13. Screw the stud of special tool MF.490 into the end of the output shaft.
14. Slide the assembly tool over the stud and shaft.

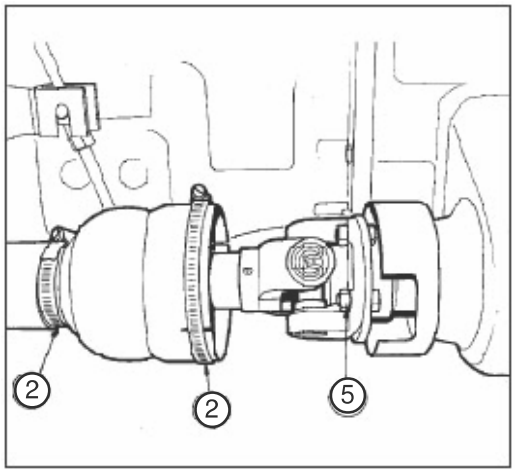

Fig 20

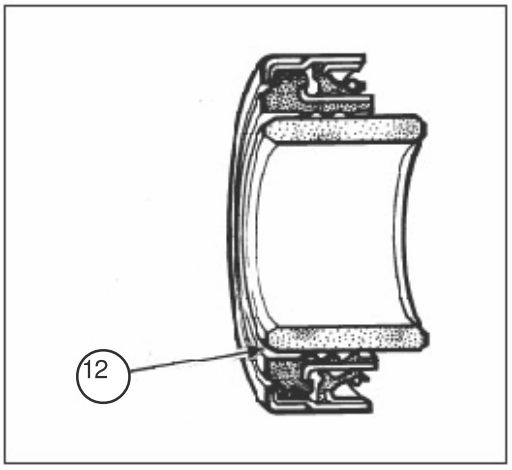

Fig 21

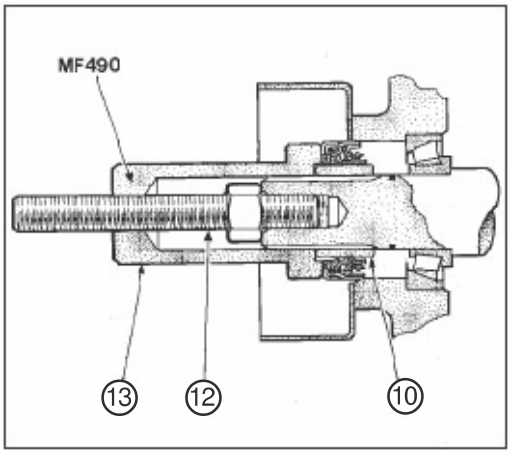

Fig 22

15. Fit the nut and washer.
16. Screw the nut upon the stud until the tool pushes seelve hard against the bearing. The seal is now in the correct position.
17. Remove the tool.

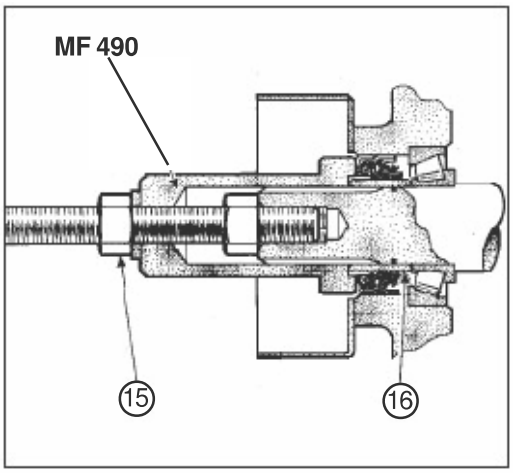

Fig 23

18. The correct position of the seal is 0.118 inch (3 mm) behind the front face of the sleeve (See illustration in Fig 24).
19. Coat the splines of the output shaft with Hylomar sealant.
20. Refit the drive coupling, drive shaft and guard as described in operation 9C - 3.
21. Apply Massey Ferguson studlock (Loctite 270) to the central bolt and tighten to a torque of 92 lbf.ft (125 Nm).
22. Apply Massey Ferguson studlock (Loctite 270) to the coupling bolts and tighten to a torque of 48 lbf.ft. (65 Nm).

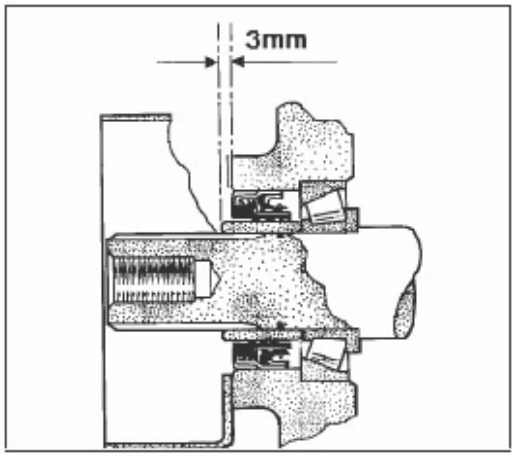

Fig 24

PAGE LEFT BLANK INTENTIONALLY